TECHNICAL MANUAL FOR EVALUATING IMPACTS OF WIND TURBINES REQUIRING COASTAL PERMITS

Wind turbines have the potential to impact birds and bats, and when located in tidal waters may also impact marine organisms such as marine mammals and sea turtles. Wind turbines may have different impacts depending on whether they are sited on land or in the water. To assess these impacts the Department has developed habitat evaluation, impact assessment, and pre- and post-construction monitoring guidelines that consist of survey protocols specific to the location of the wind turbine, on land or in tidal waters. The results will be used by the Department to evaluate the impacts of wind turbines, determine the extent to which operations are causing direct mortality to birds and bats, and the effects of construction and operation on marine organisms. This data will help inform future policies for the siting and operation of wind turbines in the coastal region. The technical manual is divided into two sections: Protocols for Evaluating Wildlife Impacts of Wind Turbines on Land; and Protocols for Evaluating Wildlife Impacts of Wind Turbines Located in Tidal Waters.

Technical Manual Overview

I. Protocols for Evaluating Wildlife Impacts of Wind Turbines Located on Land

Wind turbines on land have the potential to impact breeding, wintering and migrating birds and bats through physical strikes with the turbine blades or the loss of habitat through avoidance of areas where wind turbines are located. To assess impacts of wind turbines on birds and bats, the Department has developed pre- and post-construction monitoring guidelines that consist of survey protocols to evaluate the impacts of large wind turbines on birds and bats in the coastal region.

The CZM rules at N.J.A.C. 7:7E-7.4(r)1vii(4) require monitoring of wind turbines located on land. Specifically, pre and/or post construction monitoring is required to establish flight patterns and distribution of avian species and bats and impacts of the operation of these facilities on these species. The rule also requires the gathering of information on species composition, abundance, distribution, behavior and flight pattern heights, as well as collisions associated with the wind turbine construction and/or operation. Pre and/or post construction monitoring is dependent upon the scope of the facility including the number, height and rotor swept area of the turbines. For example, all wind turbines 250 feet in height or taller will be required to conduct pre-construction monitoring, which may include visual and acoustic surveys. Post construction monitoring, which may include carcass and visual surveys, will be required for all wind turbines unless they are less than 200 feet tall, number fewer than four at a site, and have a cumulative rotor swept area not to exceed 4,000 square feet.

A. Project Classification, Monitoring and Reporting:

The Department has taken a tiered approach to regulating wind turbines on land, based on number, height and rotor-swept area of the proposed turbines. This tiered approach is carried through to the pre- and post-construction monitoring, with the extent and duration of the monitoring being determined by the height and rotor swept area of the proposed turbines. A

summary of the definitions for each tier and the pre-and post-construction monitoring for each follows.

Tier 1 Structures:

Definition:

- 1-3 wind turbines; and
- Wind turbine(s) less than 200 feet in height as measured from ground level to the tip of the blade at its highest position; and
- Cumulative rotor swept area is less than 2,000 square feet.

Pre- and Post-Construction Monitoring Requirements:

- None

Tier 2 Structures*:* *Survey requirements apply only to the first 15 Tier 2 wind turbine developments constructed.*

Definition:

- 1-3 wind turbines; and
- Wind turbine(s) less than 200 feet in height as measured from ground level to the tip of the blade at its highest position; and
- Cumulative rotor swept area is greater than 2,000 square feet and less than 4,000 square feet.

Pre- and Post-Construction Monitoring Requirements:

- No pre-construction monitoring required.
- One full year post-construction carcass search and removal/efficiency trials. All survey results shall be provided to the Department in finalized report form no later than six months after the end of the last post-construction survey period.

Tier 3 Structures:

Definition:

- Wind turbine(s) less than 250 feet in height as measured from ground level to the tip of the blade at its highest position; and
- Cumulative rotor swept area of wind turbine(s) is 20,000 square feet or less; and
- Wind turbine(s) does not meet above definition of Tier 1 or Tier 2 structures.

Pre- and Post-Construction Monitoring Requirements:

- No pre-construction monitoring required.
- One full year of post-construction carcass searches and carcass removal/searcher efficiency trials. All survey results shall be provided to the Department in finalized report form no later than six months after the end of the last post-construction survey period.

Tier 4 Structures:

Definition:

- Wind turbine(s) greater than 250 feet in height as measured from ground level to the tip of the blade at its highest position; or
- Cumulative rotor swept area of wind turbine(s) is greater than 20,000 square feet.

Pre- and Post-Construction Monitoring Requirements:

- ***Tier 4A: 1-4 turbines***
  - One full year pre-construction visual bird and migratory bat surveys at the project site. All survey results shall be provided to the Department as an interim report no later than six months after the end of the last pre-construction survey period.
  - Two full years of post-construction carcass searches, carcass removal/searcher efficiency trials, visual bird surveys and migratory bat surveys at the project site. All survey results shall be provided to the Department in finalized report form no later than six months after the end of the last post-construction survey period.

- ***Tier 4B: 5 + turbines***
  - One full year pre-construction surveys, including visual bird surveys and migratory bat surveys at the project site and a reference site*. All survey results shall be provided to the Department as an interim report no later than six months after the end of the last pre-construction survey period.
  - Two full years of post-construction carcass searches, carcass removal/searcher efficiency trials, visual bird surveys, migratory bat surveys at the project site and a reference site. All survey results shall be provided to the Department in finalized report form no later than six months after the end of the last post-construction survey period.
  - Radar may be required based on a case-by-case review of the project, taking into account the number of turbines, the size of turbines, the proposed location for the turbines, particularly their proximity to water, wetlands, and nesting and foraging areas, and on-going review of scientific research and literature in terms of use of radar for site assessment.

*For reference sites, data will be collected using the Before-After/Control Impact study design. This provides the Department with the greatest statistical certainty as to the actual effects of wind turbines on the bird and bat species utilizing the area. For details on the BACI study design and its importance in evaluating the impacts of wind turbines, see the National Wind Coordinating Committee's "Studying Wind Energy Bird Interactions: A Guidance Document" (Anderson et al. 1999).

The technical manual contains the timing for submission of the reports as well as report format.

B. Pre-construction Surveys for Wind Turbines Located on land

Pre-construction surveys are necessary to establish the flight patterns and distribution of birds and bats at the project site. The objective of pre-construction monitoring is to document species diversity and abundance of birds and bats utilizing the habitat and airspace where the turbine(s) will be constructed. Tier 4B wind turbine surveys shall take place on both the project site location and a nearby (no less than 3 km and no more than 10 km from the project site) reference site. The reference site shall contain similar habitat features as the project site and surveys shall be coordinated to occur, as much as possible, simultaneously at both sites. Approval of survey methodologies by the Department is required prior to initiation of pre-construction monitoring.

The following visual/audio surveys are a component of pre-construction surveys for wind turbines located on land:

Breeding bird surveys:
Breeding bird activity is a component of pre- and post-construction surveys because resident breeding birds are a group that may be negatively impacted by the development of large wind turbines. There is potential for both collisions of breeding birds with turbines (Everaert and Stienen 2007) and habitat avoidance (Leddy et al. 1999) that effectively reduces the amount of habitat available for these species. This could be of particular concern if it impacts endangered or threatened species. The findings from these surveys will increase the Department's understanding of how breeding birds are impacted by wind turbines in New Jersey's coastal region.

Migrating songbird surveys:
Published studies report that, among all bird groups, passerines (including songbirds) are among the bird species most vulnerable to collision with wind turbines (Howe et al. 2002, Johnson et al. 2002, Schmidt et al. 2002, Kerns and Kerlinger 2004, Mizrahi et al. 2008). Although the majority of migrating songbirds travel nocturnally, they do use stopover habitat to rest and forage diurnally (Wiedner et al. 1992). This portion of the survey protocol is intended to capture site-use by migratory songbirds. Therefore, all songbirds, whether observed flying over or on the site, shall be recorded during this survey. Currently, only data from Cape May, NJ (NJ Audubon Society, 1988-1989, 2003-present) are available for these species. Additional data from the rest of the coastal region will augment existing data and help assess the patterns of migrating songbirds as they utilize stopover habitats. Pre- and post-construction data will be used to understand how migration densities translate into number of collisions and also elucidate whether habitat avoidance is an issue for this group of birds.

Migrating raptor surveys:
Migrating raptors are one of the most susceptible bird groups to direct impacts (collisions) of wind turbines (, Johnson et al. 2002, Schmidt et al. 2002, Mizrahi et al. 2009). The coast of New Jersey is a known migratory pathway for these species (Allen and Peterson 1936). Extensive count data exists for the fall migration in Cape May, NJ and there are five years of data available from the spring migration at Gateway National Park-Sandy Hook Unit, NJ (http://www.hmana.org/). However, there are no standardized data available to the Department at this time for the rest of the coastal region. Pre- and post-construction data will be used to understand how migration densities relate to number of collisions and also elucidate whether habitat avoidance is an issue for this group of birds.

Migrating shorebird surveys:
The potential impact of wind turbines on migrating shorebirds is not well understood. Since the large turbines that trigger these surveys are in the coastal region, and given that many thousands of shorebirds pass through this area during each migration season, a better understanding of individual site use is necessary to assess the impacts of turbines on this species group. A migrating shorebird survey may be necessary if suitable habitats exist (including oceanfront beach, tidal bays, mudflats or other areas where shorebirds are likely to congregate). Such a

survey will not be necessary if it is determined that the site contains no suitable habitat for this species group.

Wintering bird surveys:
Wintering bird surveys may be required for projects in the coastal zone because this region is known to harbor significant numbers of wintering birds, particularly waterfowl and shorebirds (NJDEP DFW unpubl. data). There has been research conducted on waterfowl migrating through areas where turbines exist and those results suggest that habitat avoidance may be an issue for this species group (Goodale and Divoll 2009). Migration, however, is different than overwintering and therefore the data collection on the behavior of wintering birds at some sites will be necessary. Such a survey will not be necessary if the Department determines that the site contains no suitable habitat for this species group.

Migratory bat surveys are another component of pre-construction monitoring. At sites around the world, bats are consistently a directly impacted species group through collisions with turbines and through barotrauma (Arnett et al. 2008, Baerwald et al. 2008). In fact, the number of mortalities of bats exceeds the number of bird mortalities at many sites where data has been collected, including at the Atlantic County Utilities Authority site, currently the only large-scale wind turbine site in New Jersey's coastal region (Arnett et al. 2008, Mizrahi et al. 2008). Therefore, understanding the utilization of the coastal zone by bats is paramount to taking steps to reduce mortality through siting decisions and possible temporary curtailment in operations. Since bats are nocturnal and nearly impossible to visually survey, the best method currently available to census densities of bats traveling through potential wind turbine sites is through acoustical detectors.

For Tier 4B wind turbines, radar surveys may be required. The Department will make such a determination taking into account the number of turbines, the size of turbines, the proposed location for the turbines, particularly their proximity to water, wetlands, and nesting and foraging areas, and on-going review of scientific research and literature in terms of use of radar for site assessment. Radar surveys are used to determine activity and patterns of nocturnally migrating birds and bats.

C. Post-construction monitoring for Wind Turbines Located on Land
Post-construction monitoring is necessary to assess effects of the operation of wind turbines on birds and bats. The objectives of post-construction monitoring are to quantify the direct (bird/bat collisions and barotrauma) and indirect (habitat avoidance) impacts of wind turbines on New Jersey's bird and bat wildlife resources. These surveys are to be performed for one full year after wind turbine construction for applicants issued permits for Tier 2 and Tier 3 wind turbines and two full years after turbine construction for applicants issued permits for Tier 4 wind turbines. Approval of survey methodologies by the Department is required prior to initiating post-construction monitoring.

One component of post-construction monitoring is carcass searches. Carcass searches represent perhaps the best method we have to directly measure collisions and barotrauma caused by wind turbines to birds and bats. Carcass searches will be conducted only on the project site and will focus on migratory seasons when the highest numbers of collisions would be expected to occur.

Another component of post-construction monitoring is carcass removal trials/searcher efficiency trials. The results of carcass searches can be biased due to the removal of carcasses by scavengers before they can be counted as well as observer bias/error (Johnson et al. 2003). In order to better estimate the actual numbers of fatalities, the carcass removal trials are necessary to assess the impacts of scavengers, and searcher efficiency trials to correct for observer bias. Carcass removal trials are conducted by placing fresh carcasses in the search area and noting how long it takes for the carcass to be removed by a scavenger. Searcher efficiency trials involve a third party placing carcasses in the search area without the searcher knowing where they were placed. The number of carcasses detected and missed will inform each searcher's efficiency. These trials must be carried out throughout (and concurrent with) the carcass surveys.

In addition to carcass and carcass removal trials/searcher efficiency trials, visual bird surveys, migratory bat surveys and where necessary, radar surveys are components of post-construction monitoring.

II. Protocol for Evaluating Wildlife Impacts of Wind Turbines Located in Tidal Waters

Wind turbines in tidal waters have the potential to impact birds, bats and marine organisms. The potential impacts of wind turbines in tidal waters on birds and bats are similar to those located on land. Other marine organisms, including marine mammals and sea turtles, may also be affected by the wind turbine construction and operation. While the impacts of wind turbines on marine organisms are not well understood, it is known that marine mammals are sensitive to noise and vibrations. Marine mammals, particularly whales, and sea turtles are vulnerable to vessel strikes. Because there is limited information on the abundance, distribution and behavior of these species offshore of New Jersey, the Department has developed habitat evaluation, impact assessment and monitoring guidelines for wind facilities in tidal waters.

In accordance with N.J.A.C. 7:7E-7.4(r)1viii(3), habitat evaluations, including species surveys, impact assessments and post-construction monitoring are required in order to establish the movement corridors and distribution of birds, bats, and marine organisms and impacts of the construction and/or operation of these facilities on these species. Information shall be gathered on species composition, abundance, distribution, behavior, collisions, behavioral changes and, for birds and bats, flight pattern heights, associated with wind turbine construction and/or operation. The habitat evaluation, impact assessment and post construction monitoring are dependent upon the scope of the facility including the number, height and rotor swept area of the turbines. Habitat evaluations, impact assessments and post-construction monitoring and reporting requirements will be coordinated with the Department, US Fish and Wildlife Service, and National Marine Fisheries Service. The habitat evaluation contents vary depending upon the tidal water in which the proposed project is located.

An impact assessment is necessary in order to identify the potential impacts of the construction and operation of a wind facility on birds, bats and marine organisms identified in the habitat evaluation. Impact assessments shall consider the likely affects of the proposed wind energy facility on the particular species on or adjacent to the project site and on species that would likely move or migrate through the project site at any time during the year. The impacts shall be

assessed using accepted ecological principles and scientific literature on each species and both direct and indirect impacts of the proposed development shall be considered. This assessment shall be based on the habitat requirements and life history of each species, and the manner in which the proposed development may alter habitat, including, but not limited to, aerial space used by birds and bats, finfish migratory pathway, and migratory pathways used by marine mammals and turtles. The information provided must demonstrate compliance with applicable rules, including Endangered or threatened wildlife species habitat (N.J.A.C. 7:7E-3.38), Critical wildlife habitat (N.J.A.C. 7:7E-3.39), Shellfish habitat (N.J.A.C. 7:7E-3.2), Surf clam areas (N.J.A.C. 7:7E-3.3), Prime fishing areas (N.J.A.C. 7:7E-3.4), Finfish migratory pathways (N.J.A.C. 7:7E-3.5), and Marine fish and fisheries (N.J.A.C. 7:7E-8.2)

Post-construction monitoring is necessary to assess the impacts of the operation of wind turbine facilities on birds, bats and marine organisms. Monitoring technologies are changing rapidly and some typical accepted monitoring techniques, such as carcass searches, would not be practical in water. The Department will continue to evaluate emerging technologies, working with the United States Fish and Wildlife Service, Bureau of Ocean Energy Management, Regulation, and Enforcement, National Marine Fisheries Service and other federal agencies, to determine appropriate post-construction monitoring protocols. In addition, the Department will use information gained through the Ecological Baseline studies to refine protocols. Therefore, post-construction monitoring for wind turbines located in tidal waters will be determined on a case-by-case basis. However, applicants can expect a similar protocol to the baseline study and this may include visual and acoustic surveys (for birds, bats, marine mammals and sea turtles) surveys for marine organisms (such as fish and benthic species) and avian radar. These surveys would be required both pre- construction (for one year) and post-construction (for two years). Although techniques for assessing offshore post-construction mortality are in their nascent stages, some form of post-construction mortality survey is also likely to be required. As with onshore surveys, a BACI design will be incorporated and a reference area will be required. Exact distance from project area, as well as detailed monitoring requirements, will be determined through consultation with Department.

III. References

The following is a listing of references used in developing the technical manual.

Allen, R. P., R. T. Peterson. 1936. The hawk migration at Cape May Point. Auk 53:393-404.

Anderson, R., M. Morrison, K. Sinclair, D. Strickland. 1999. Studying wind energy/bird interactions: a guidance document. Metrics and methods for determining or monitoring potential impacts on birds at existing and proposed wind energy sites. Prepared for the Avian Subcommittee of the National Wind Coordinating Committee. http://www.nationalwind.org/publications/wildlife/avian99/Avian_booklet.pdf

Arnett, E.B., W.K. Brown, W.P. Erickson, J. K. Fiedler, B.L. Hamilton, T. H. Henry, A. Jain, G. D. Johnson, J. Kerns, R. R. Koford, C. P. Nicholson, T. J. O'Connell, M.D. Piorkowski, and R. D. Tankersley JR. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. Journal of Wildlife Management 72(1):61-78.

Baerwald, E.F., G.H. D'Amours, B.J. Klug, R.M.R. Barclay. 2008. Barotrauma is a significant cause of bat fatalities at wind turbines. Current biology 18(16):695-696.

Everaert, J., E. W. M. Stienen. 2007. Impact of wind turbines on birds in Zeebrugge (Belgium). Biodiversity and Conservation 16:3345-3359.

Goodale W. ,T. Divoll. 2009. Birds, Bats and Coastal Wind Farm Development in Maine: A Literature Review. Report BRI 2009-18. BioDiversity Research Institute, Gorham, Maine.

Guidelines for Conducting Bird and Bats Studies at Commercial Wind Energy Projects. Prepared by New York State Department of Environmental Conservation Division of Environmental Permits and Division of Fish, Wildlife and Marine Resources. December 2007. http://www.dec.ny.gov/docs/fish_marine_pdf/drwindguide1207.pdf

Huff, M. H., K.A. Bettinger,. H.L. Ferguson,. M.J. Brown, B. Altman. 2000. A habitat-based point-count protocol for terrestrial birds, emphasizing Washington and Oregon. Gen. Tech. Rep. PNW- G T R - 5 0 1. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 39 p. http://www.dodpif.org/downloads/point-count-protocol-WA-OR.pdf

Howe, R.W., W. Evans, A.T. Wolf. 2002. Effects of wind turbines on birds and bats in northeastern Wisconsin: a report submitted to Wisconsin Public Service Corportation and Madison Gas and Electric Company.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, S.A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind-power development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 30 (3):879-887.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd. 2003. Mortality of bats at a large-scale wind power development at Buffalo Ridge, Minnesota. The American Midland Naturalist 150(2):332-342.

Kerns, J., P. Kerlinger. 2004. A study of bird and bat collision fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: Annual report for 2003. Prepared by Curry & Kerlinger LLC for FPL Energy and Mountaineer Wind Energy Center Technical Review Committee.

Kunz, T.H., E.R. Arnett, B.M. Cooper, W.P.Erickson, R.P. Larkin, T. Mabee, M.L. Morrison, M.D. Strickland, J.M. Szewczak. 2007. Assessing impacts of wind-energy development on nocturnally active birds and bats: a guidance document. Journal of Wildlife Management 71(8):2449–2486.http://www.batsandwind.org/pdf/jwm_m&m.pdf

Leddy, K.L., K.F. Higgins, D.E. Naugle. 1999. Effects of wind turbines on upland nesting birds in Conservation Reserve Program grasslands. Wilson Bull. 111:100-104.

Mabey, S. E., J. M. McCann, L. J. Niles, C. Bartlett, P. Kerlinger. 1993. The Neotropical ,migratory songbirds coastal corridor study: Final report. Virginia Department of Environmental Quality to the National Oceanic and Atmospheric Administration's Office of Ocean and Coastal Resource Management (NOAA grant # NA90AA-H-CZ839). 72 pages. http://www.state.nj.us/dep/fgw/ensp/pdf/literature/regional-study_coastal_mig_stopover_hab.pdf

Mizrahi, D.S., K.A. Peters, V. Elia. 2008. Post-construction wildlife monitoring at the Atlantic City Utilities Authority-Jersey Atlantic Wind Power Facility. Draft report by New Jersey Audubon Society, Cape May Court House, NJ.

NJ DFW, Unpublished data. Mid-winter waterfowl survey, 1955-2009. New Jersey Division of Fish and Wildlife, Trenton, NJ.

On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio: An Addendum to the Ohio Department of Natural Resource's Voluntary Cooperative Agreement. http://www.dnr.state.oh.us/LinkClick.aspx?fileticket=S24B8hy2Iu4%3d&tabid=21467

Schmaljohann, H., F. Liechti, E. Bachler, T. Steuri, B. Bruderer. 2008. Quantification of bird migration by radar –a detection probability problem. Ibis 150: 342–355. http://infonet.vogelwarte.ch/upload/60228466.pdf

Schmidt, E., A.J Piaggio, C.E. Bock, D.M. Armstrong. 2002. National Wind Technology Center environmental assessment: bird and bat use and fatalities- final report. University of Colorado, Boulder.

Somershoe, S.G.,D.J. Twedt, B. Reid. 2006. Combining breeding bird survey and distance sampling to estimate density of migrant and breeding birds. The Condor 108: 691-699. http://www.pwrc.usgs.gov/prodabs/ab04060906/6599_Somershoe.pdf

Wakeley, J.S. 1987. Avian-line transect methods: Section 6.3.2, US Army Corps of Engineers Wildlife Resources Management Manual, Technical Report EL-87-5, US Army Engineer Waterways Experiment Station, Vicksburg, Miss. http://el.erdc.usace.army.mil/elpubs/pdf/EL87_5.pdf

Wiedner, D.S., P. Kerlinger, D.A. Sibley, P. Holt, J. Hough, R. Crossley. 1992. Visible morning flights of neotropical landbird migrants at Cape May, New Jersey. Auk 109:500-510.

Appendix A. Datasheet and instructions for Breeding Bird Surveys: This appendix contains the survey methodology and data recording provisions.

Appendix B. Datasheet and instructions for Migratory Bird Surveys: This appendix contains the survey methodology and data recording provisions.

Appendix D. Migratory Shorebird and Wintering Bird Survey Protocol: This appendix contains the general timing and frequency of surveys, survey stratification and chronology.

Appendix E1. Datasheet for Migratory Shorebird and Wintering Bird surveys-total counts and plot surveys.
Appendix E2. Datasheet for Migratory Shorebird and Wintering Bird surveys-Flight Altitude, Direction, Flock Size and Composition: These appendices contain the data sheets and general directions for data sheet completion.

Appendix F. Datasheet and instructions for Carcass Searches: This appendix contains the data sheets and general directions for data sheet completion.

Appendix G1. Datasheet for Carcass Removal Trials Form
Appendix G2. Datasheet for Searcher Efficiency Trials: Carcass Placement Log: These appendices contain the data sheets for carcass removal trials and searcher efficiency trials.

Program Change Analysis

To assess impacts of wind turbines on birds and bats, the Department has developed the Technical Manual for Evaluating Wildlife Impacts of Wind Turbines Requiring Coastal Permits. The technical manual contains the Department's monitoring guidelines which consist of survey protocols to evaluate the impacts of wind turbines on birds and bats in the coastal region.

The CZM rules at N.J.A.C. 7:7E-7.4(r)1vii(4) and Coastal Permit Program rules at N.J.A.C. 7:7-7.30(a)8 and 7.31(a)9 require monitoring of wind turbines on land. Specifically, pre and/or post construction monitoring is required to establish flight patterns and distribution of avian species and bats and impacts of the operation of these facilities on these species. The rule also requires the gathering of information on species composition, abundance, distribution, behavior and flight pattern heights, as well as collisions associated with the wind turbine construction and/or operation. Pre and/or post construction monitoring is dependent upon the scope of the facility including the number, height and rotor swept area of the turbines. For example, all wind turbines 250 feet in height or taller will be required to conduct pre-construction monitoring, which may include visual and acoustic surveys. Post construction monitoring, which may include carcass and visual surveys, will be required for all wind turbines unless they are less than 200 feet tall, number fewer than four at a site, and have a cumulative rotor swept area not to exceed 4,000 square feet. Pre- and post construction radar surveys may be required for Tier 4B turbines as determined by the Department on a case-by-case review of the proposed project taking into consideration the number of turbines, the size of turbines, the proposed location for the turbines, particularly their proximity to water, wetlands, and nesting and foraging areas. The technical manual supplements this rule requirement by prescribing the survey methodology, procedures and format for submittal of this information.

Similarly, the CZM rules at N.J.A.C. 7:7E-7.4(r)1viii(3) require monitoring of wind turbines located in water. Specifically the rule requires a habitat evaluation, impact assessment and post-construction monitoring to establish the abundance, distribution, and behavior of avian species, bats, and marine organisms and assess the impacts of the construction and/or operation of these facilities on these species. Applicants are required to gather information on species composition, abundance, distribution, behavior and, for avian species and bats, flight pattern heights, as well as collisions and behavioral changes associated with wind turbine construction and/or operation

in order to determine the acceptability of wind turbines at a specific location in tidal waters. Requirements will be coordinated with the United States Fish and Wildlife Service, National Marine Fisheries Service, and if in federal waters, the Bureau of Ocean Energy Management, Regulation, and Enforcement, all of which have authority and expertise in these areas. The technical manual provides guidance on habitat evaluations and assessments, monitoring and reporting.

As demonstrated above, the technical manual provides further clarity to the Department's Energy facility use rule as it pertains to the construction of wind facilities. The Department does not consider the inclusion of the manual to be a substantial change to the program approvability areas of "uses subject to management" and "authorities and organization" as the standards for monitoring are contained in the CZM rules.

The technical manual was created to provide additional guidance and survey protocols for the monitoring of wind turbines in New Jersey's coastal area. The Department believes that the inclusion of the technical manual into New Jersey's Coastal Management Program enhances the program approvability area of "Coordination, public involvement and national interest." By clarifying the monitoring requirements of the CZM rules, the technical manual enhances the Department's coordination with applicants and Federal agencies. The technical manual does not set forth the permit application requirements, as these are established in the Department's Coastal Permit Program rules, N.J.A.C. 7:7. The Department will continue to coordinate with applicants and Federal agencies and provide for public participation in the decision-making process, thus there are no substantial changes to coordination and public involvement. Further, the national interest in alternative energy facilities will not be substantially affected as the State is actively working with applicants for offshore wind facilities and Federal Agencies with respect to the Department's monitoring requirements to assess the impacts of offshore wind facilities on birds, bats and marine organisms.

The inclusion of the technical manual into New Jersey's Coastal Management Program does not result in changes to the five program approvability areas.